

Accelerator Status during LS2RRB

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15th April 2019



Injectors and LHC: Q4-2018 schedules

End all proton physics
ISO, EA, AD, nTOF, NA,
HiRadMat, AWAKE

End LHC (06:00)

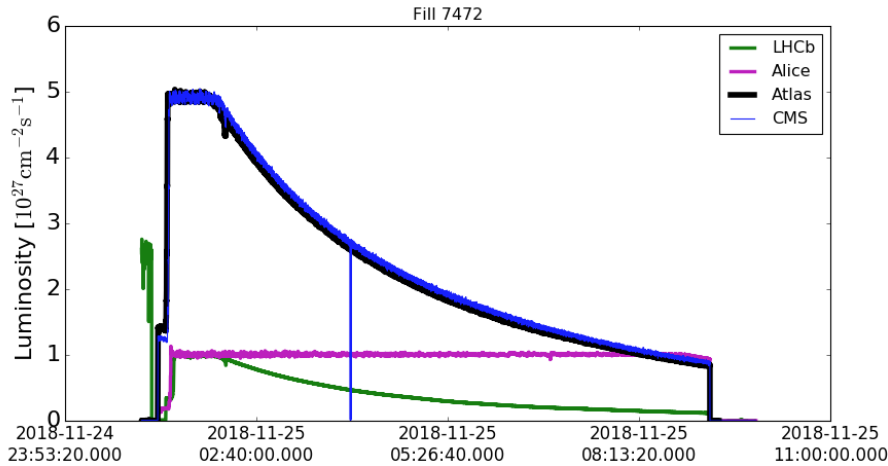
End injectors,
NA, EA (06:00)
End Clear

Wk	40	41	42	43	44	45	46	47	48	49	50	51	52	
Mo	1	8	15	22		5	RP cooldown & survey PSB/PS/SPS 30hrs + 4	12	19	26	3	10	17	Xmas 24
Tu														
We	Ded. Inj. MD 13 hrs 7 to 20	Ded. Inj. MD 10 hrs 8 to 18	Ded. Inj. MD 10 hrs 8 to 18	Ded. Inj. MD 13 hrs 7 to 20	COLDEX 24 hrs	Ded. Inj. MD 10 hrs 8 to 18		Ded. Inj. MD 10 hrs 8 to 18	Ded. Inj. MD 24 hrs 8 to 8		Long Shutdown 2			
Th	Par. SPS MD 10 hrs 8 to 18	Par. SPS MD 10 hrs 8 to 18	Par. SPS MD 10 hrs 8 to 18	Par. SPS MD 10 hrs 8 to 18	Ded. Inj. MD 10 hrs 8 to 18	Par. SPS MD 10 hrs 8 to 18								
Fr						LHC Pb-Pb ion physics 4 wks								
Sa						North & East Area Pb ion Physics 4 wks								
Su														

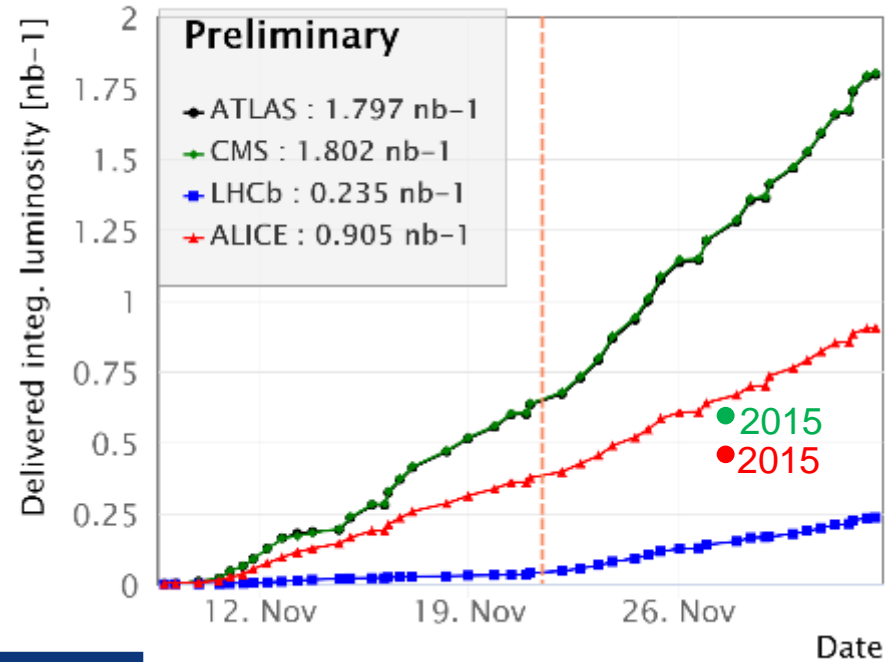
Wk	40	41	42	43	44	45	46	47	48	49	50	51	52
Mo	1	8	15	22		5	12	19	26	3	10	17	Xmas 24
Tu						Ion setting up		MD 5					
We											Long Shutdown 2		
Th					TS3		LHC Pb- Pb Ion run						
Fr		Special physics run		MD 4						Powering Tests Magnet Training			
Sa													
Su													

Magnet training tests to aiming for 7 TeV after LS2

Pb-Pb delivered luminosities



Initial 10 year Pb-Pb luminosity goal of 1 nb^{-1} reached in 2 runs.

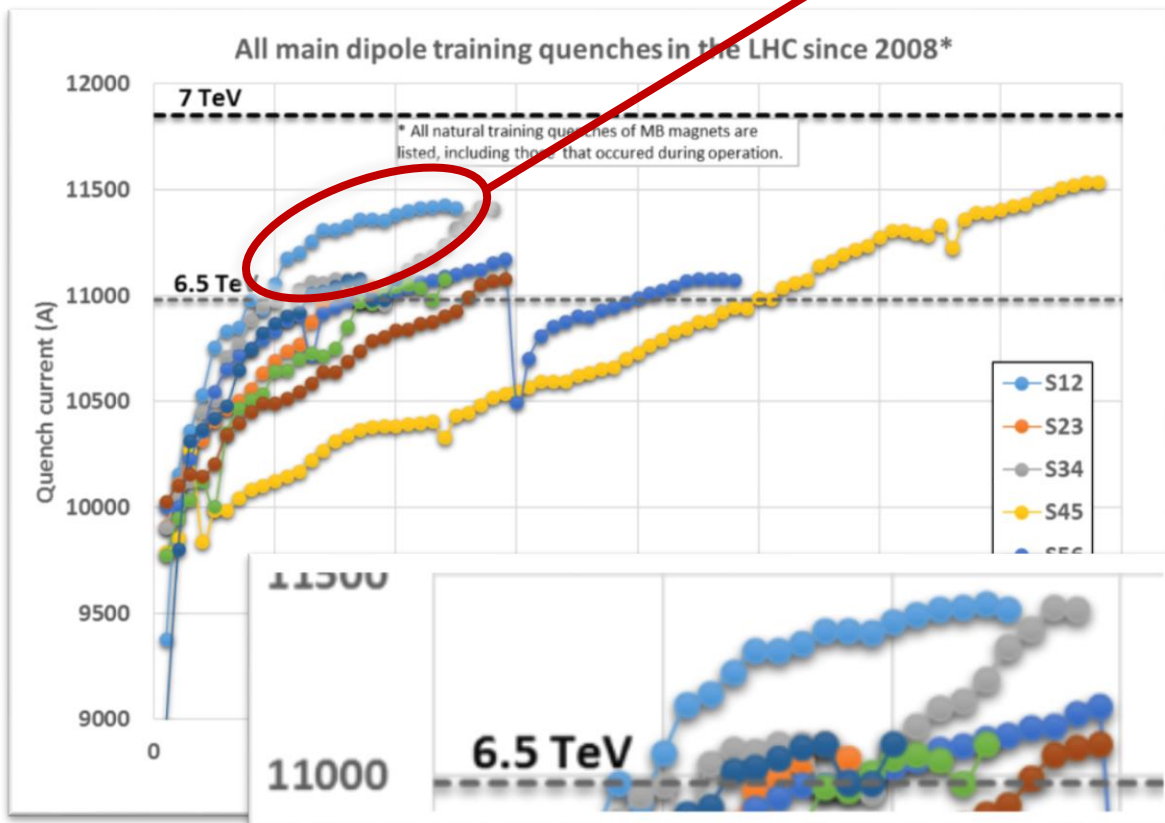


	Delivered (by 03.12.2018)	2015 Pb-Pb	
ATLAS/CMS [μb^{-1}]	1800	584	x 3
ALICE [μb^{-1}]	905	433	x 2
LHCb [μb^{-1}]	235	6	x 39

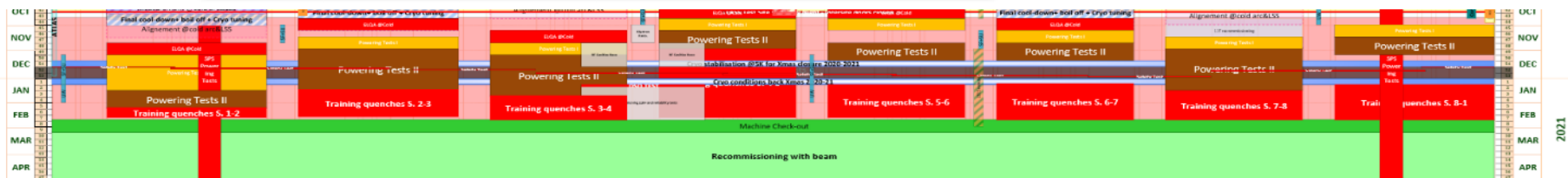
LHCb int. luminosity ~two orders of magnitude above 2015 performance

Powering Test before LS2 (1 week)

15 quenches done
6.76 TeV equivalent reached

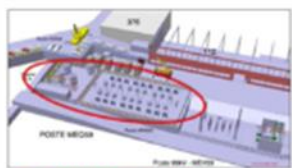


- 8 sectors reached 6.5 TeV with about 170 quenches
- 3 sectors reached about 6.75 TeV with 50 more quenches
- Large difference in behaviour between different sectors
- S12: slower training than predicted

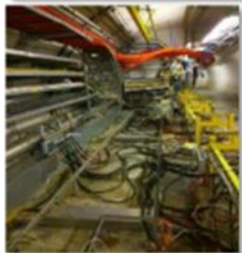


LS2 (2019-2020 period): coordination of multi projects

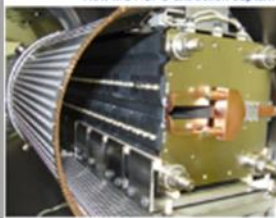
Maintenance & Consolidation



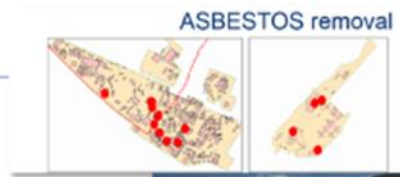
New MEQ59 Static Var Compensator



New MST SPS extraction septum



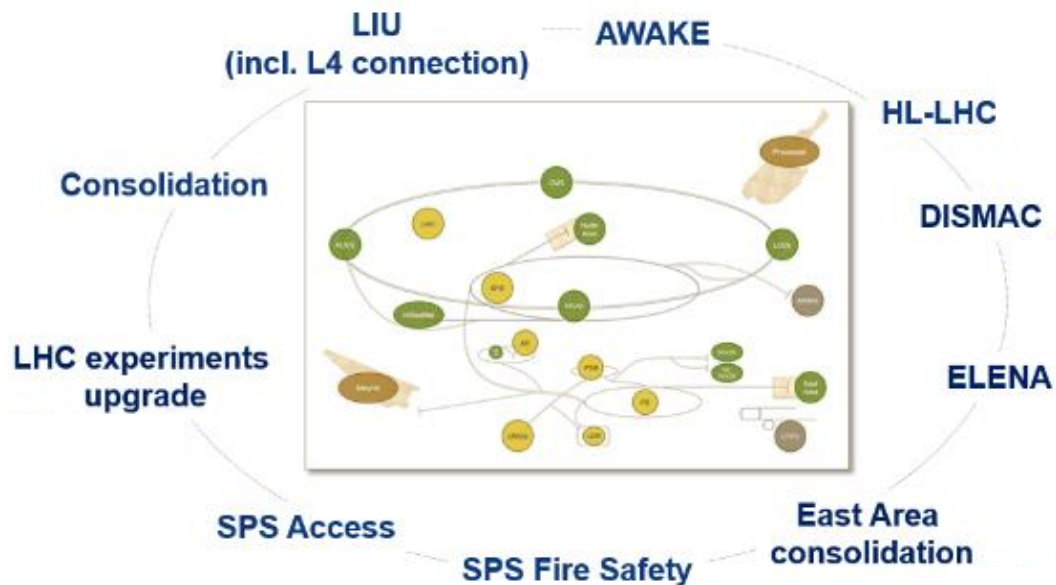
LHC EE controls



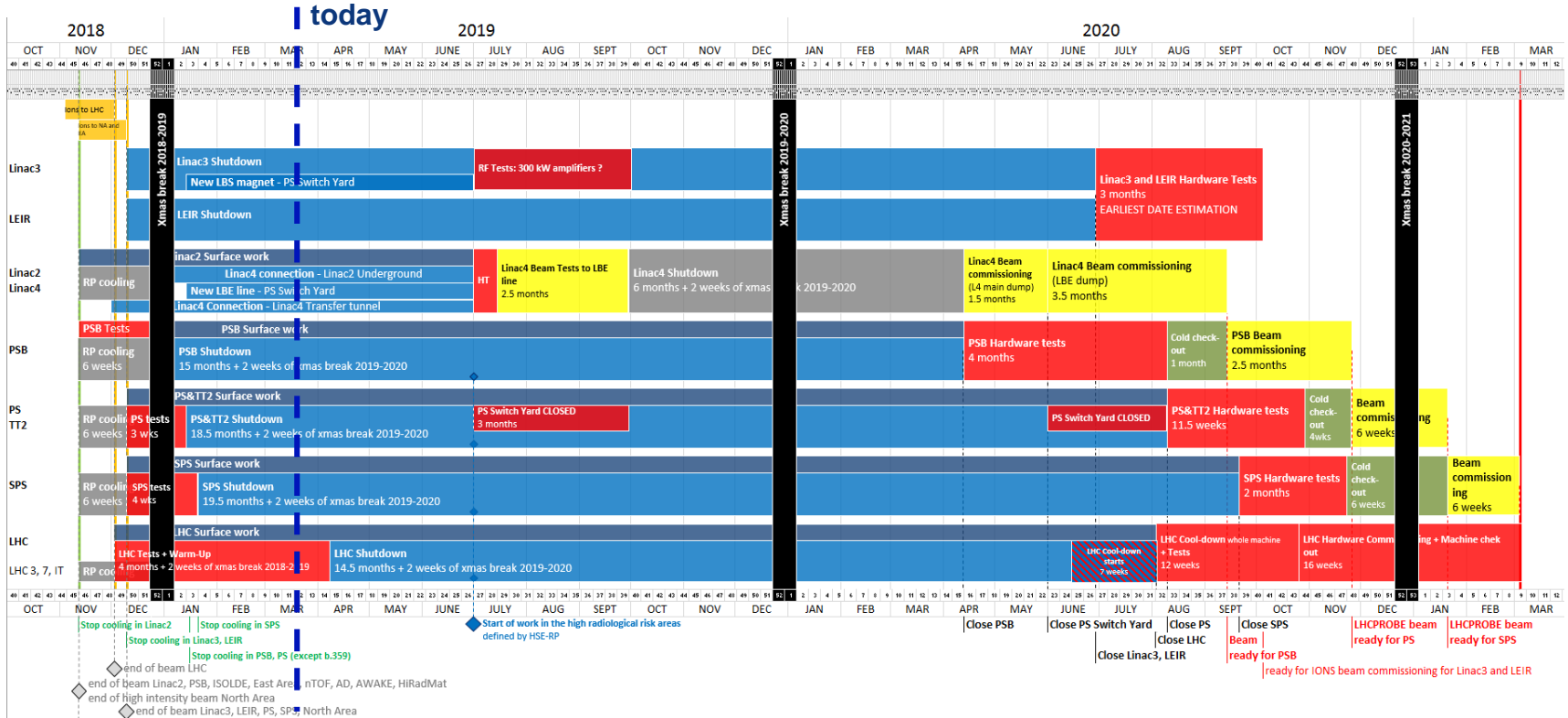
ASBESTOS removal

LS2 is dominated by LIU

The main projects during LS2



Master Schedule of the Long Shutdown 2



Safety First



Quality second



Schedule third

LS2: Booster



Linac4 Transfer Line

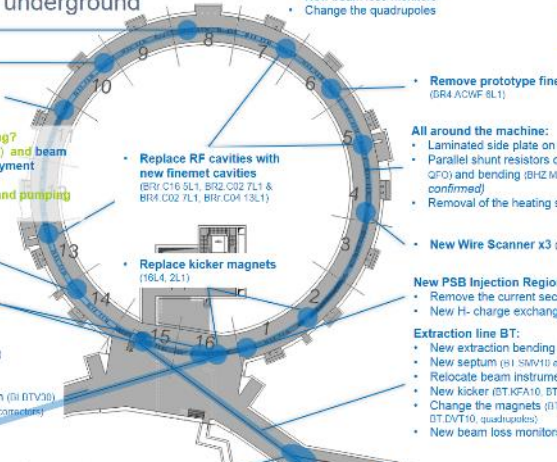
Linac 4 connection



LS2 activities

PS Booster - underground

- New Absorber/Scraper (8L4)
- Remove RF cavities (BR1 CO2 10L1 & BR2 CO2 10L1)
- New Wire Scanner x4 (11L1)
- Refurbishment of the painting?
- Warm interlock control (WIC) and beam interlock system (BIS) deployment
- Consolidation of the B-train
- Replacement of ion pumps and pumping groups
- Replace extraction kicker (BR1 KI A14L1)
- Replace bending magnets (INJ DI21B2 EXT DI21S1)
- Injection line BI:
 - New injection bending (BI IZ INJ)
 - New Distributor (BI DIS10)
 - New Septa (BI SMV10)
 - Relocate beam instrumentation (BI BITV30)
 - Change of the magnets (BI V15, correctors)
 - New BPMs
 - New beam loss monitors
 - New RF bypasses
- Change the bending magnets (BT BHZ10, BTM.BHZ10)
- Change the beam stopper (BTP STP10)
- Upgrade magnets (quadrupoles) and add new corrector magnets
- Remove prototype finemet cavities (BR ACWF 8L1)
- All around the machine:
 - Laminated side plate on bending (BHZ MAIN)
 - Parallel shunt resistors on quadrupoles (QD, QFO) and bending (BHZ MAIN) magnets (to be confirmed)
 - Removal of the heating systems
- New Wire Scanner x3 (4L1)
- New PSB Injection Region
 - Remove the current sector (11L1)
 - New H-charge exchange injection systems
- Extraction line BT:
 - New extraction bending (BT IZ EXT)
 - New septum (BI SMV10 and BI SMV20)
 - Relocate beam instrumentations (BT BITV10)
 - New kicker (BT KFA10, BT KFA20)
 - Change the magnets (BT IVT10, BT IVT20, BT DVT10 quadrupoles)
 - New beam loss monitors
- New vacuum window on BTM line before the PSB Dump



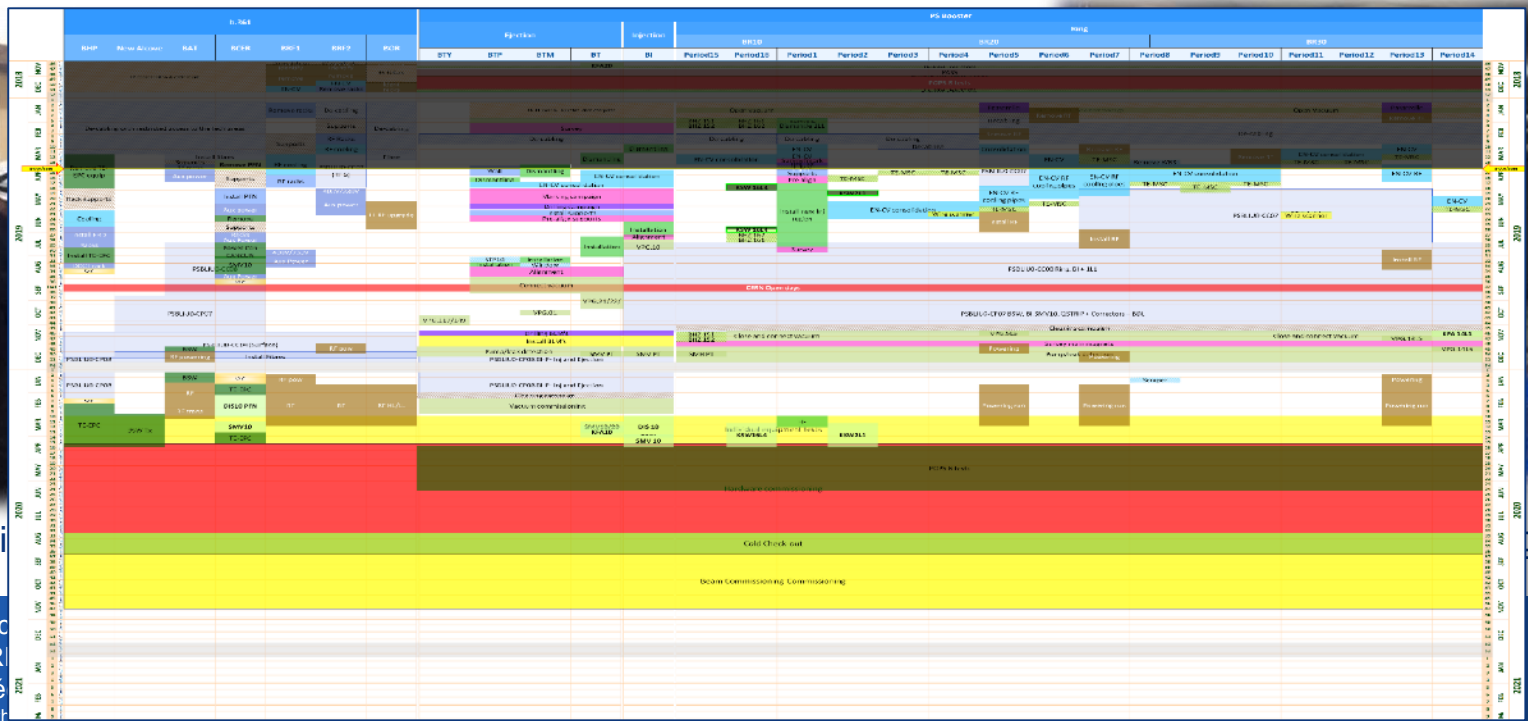
Extraction line BTP: (see PS57T2 coordination)

- Modification of the beam instrumentations
- New beam position monitor
- New beam loss monitors
- Change the quadrupoles

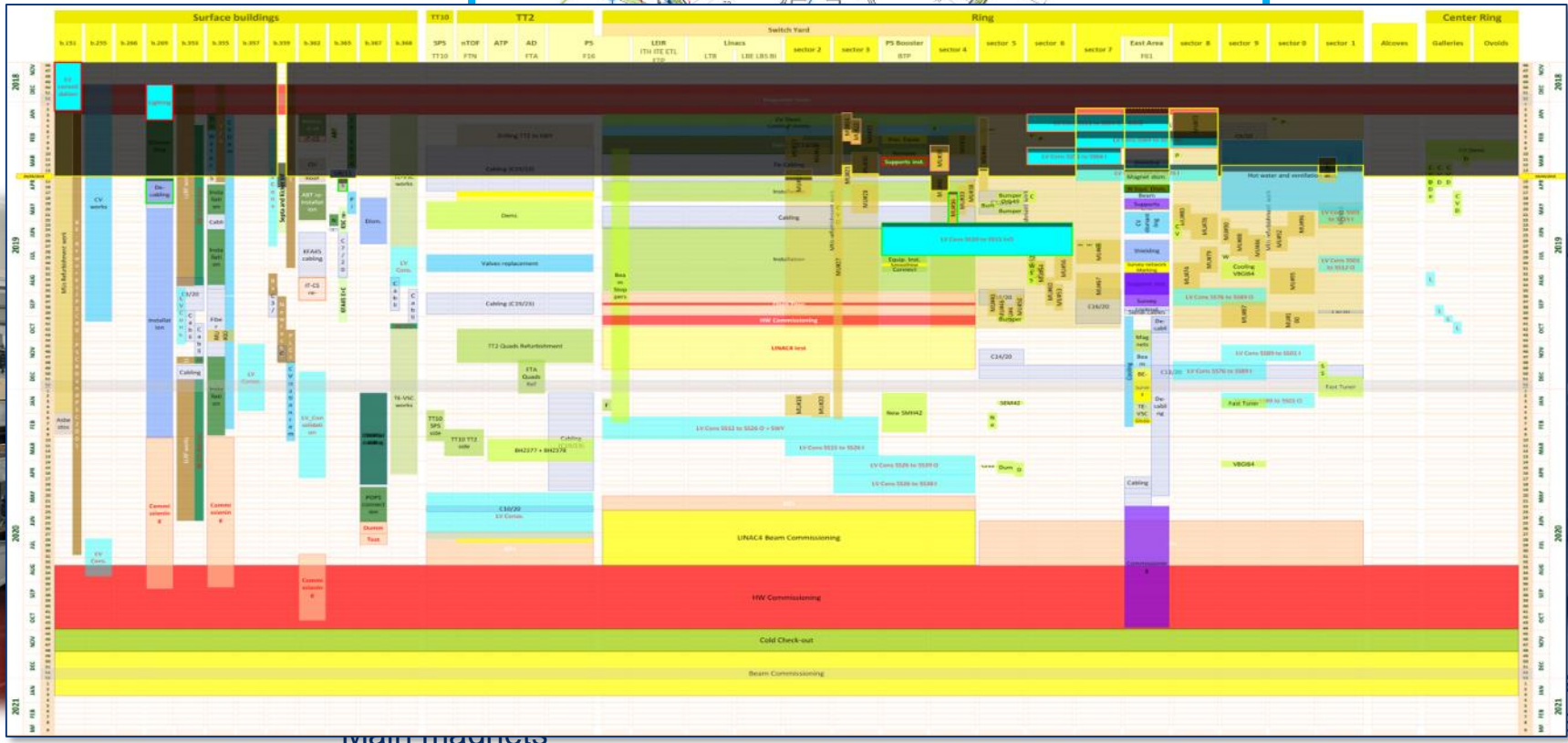
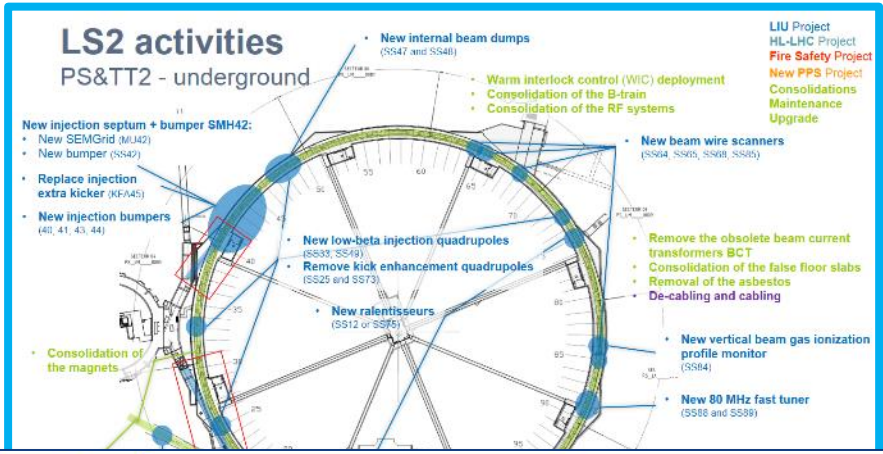
LIU Project
HL-LHC Project
Fire Safety Project
New PPS Project
Consolidations
Maintenance
Upgrade

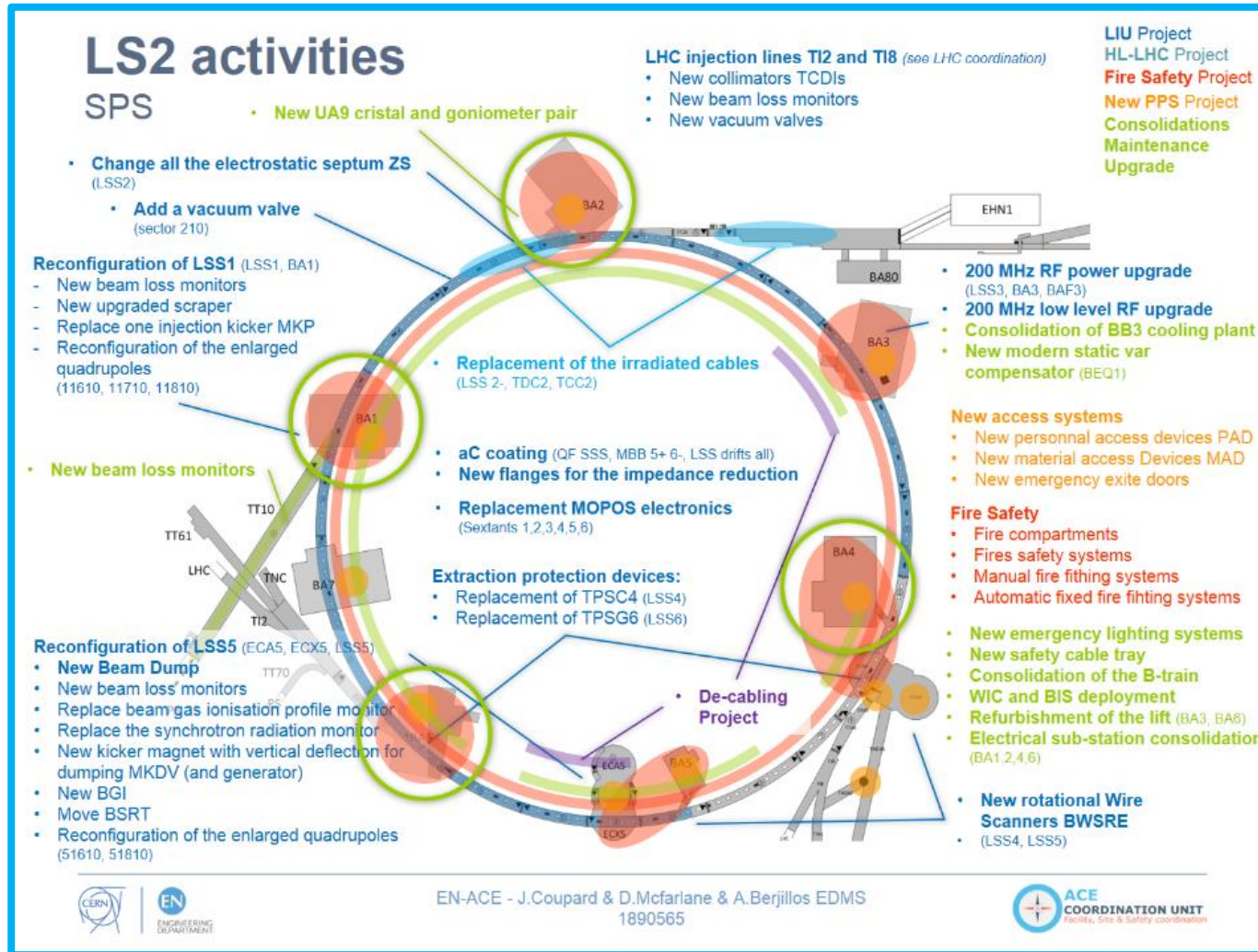


De-cabli

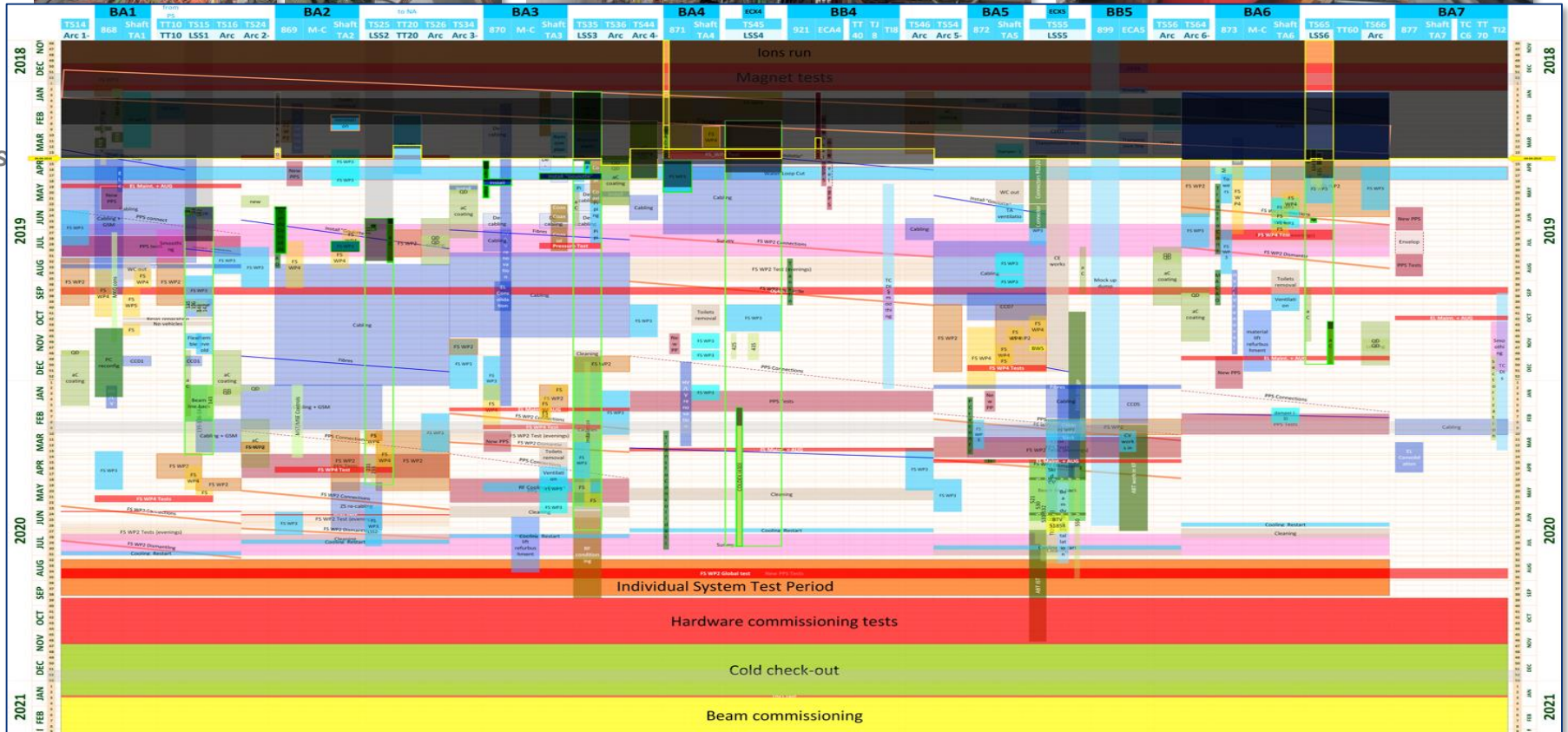


g system

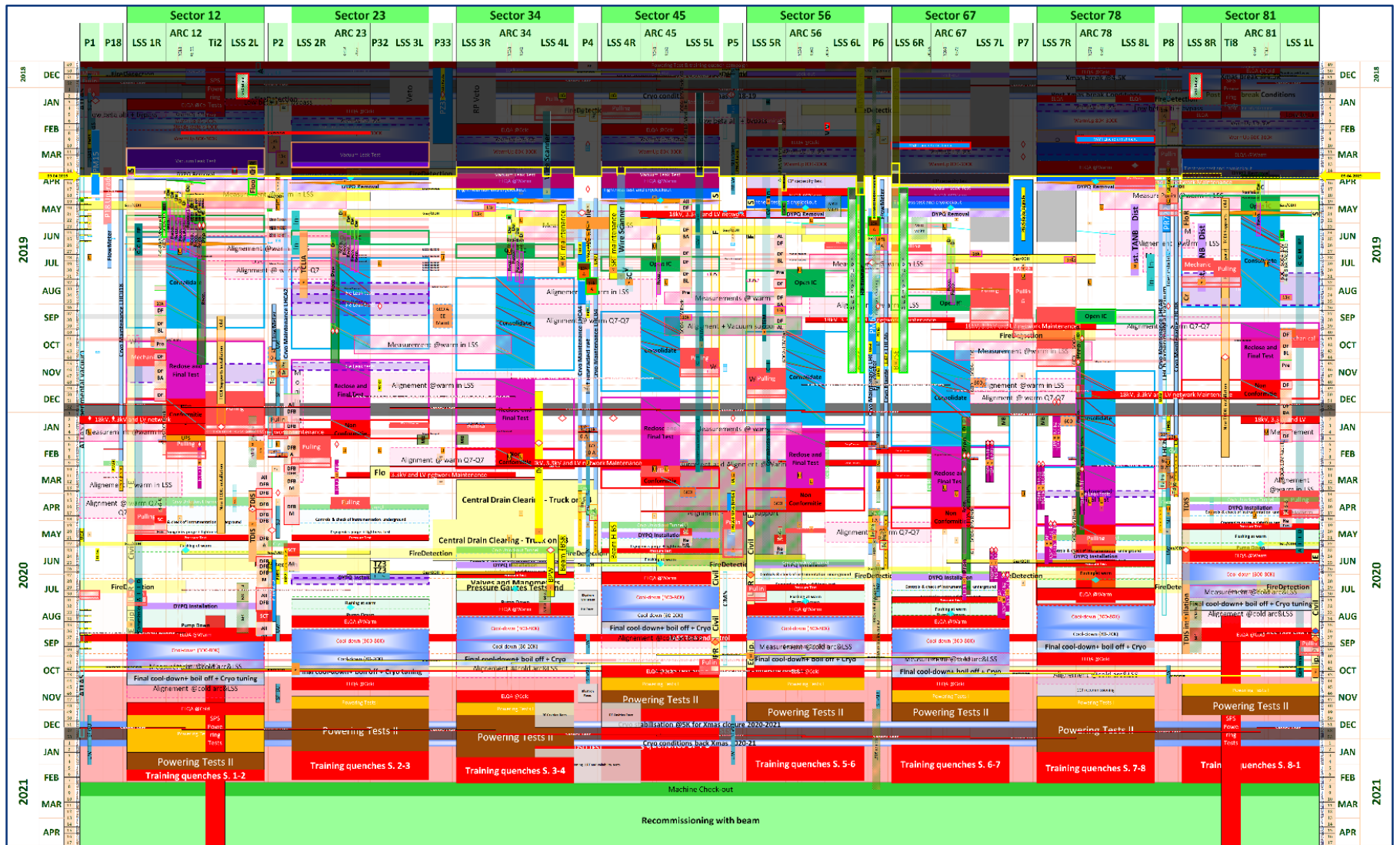




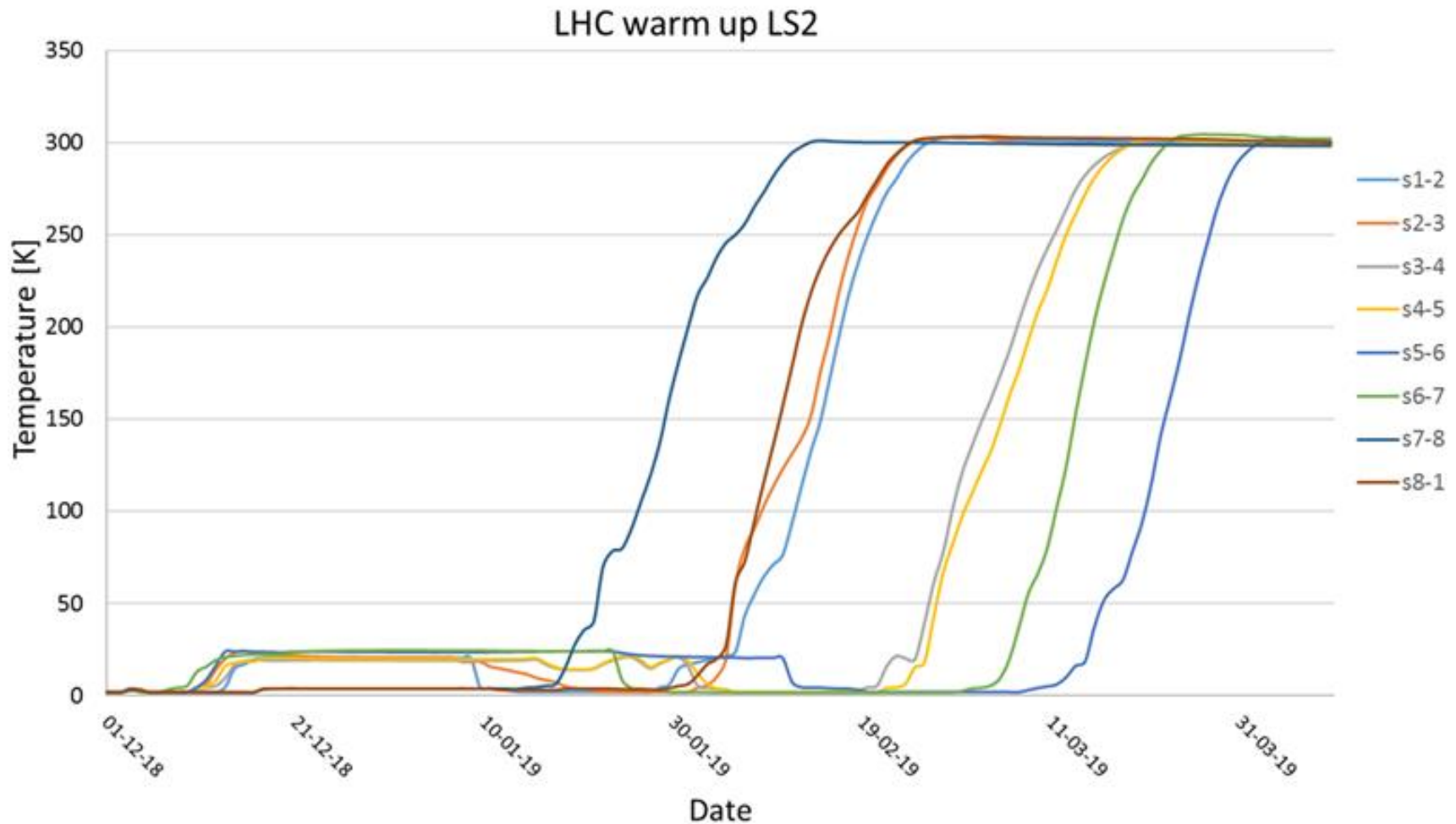
LS2: SPS highlights



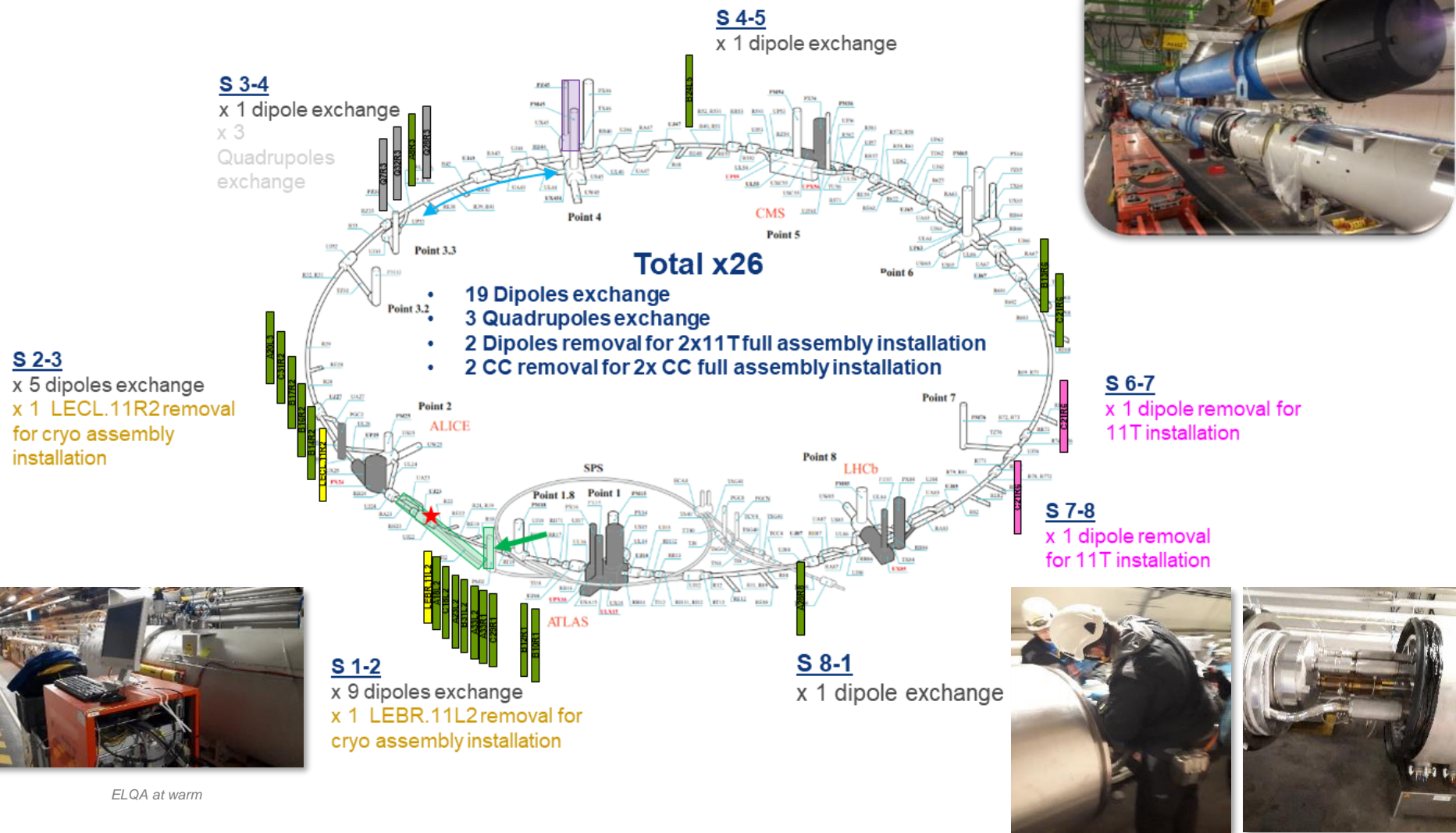
LHC: LS2 planning (version 1.4)



LS2: LHC warming-up status (on 31st March 2019)



LS2: Superconducting Magnet replacements



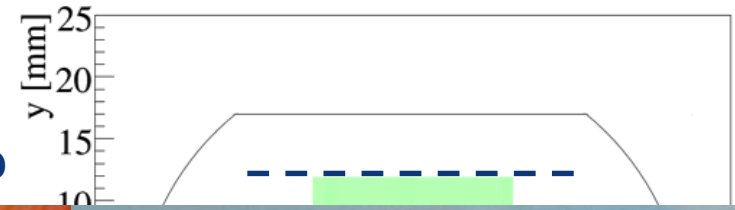
ELQA at warm

IC openings in Sector 8-1

Aperture in 15R8 : MUFO => ULO

Aperture restriction:

- ✧ Measured at injection and 6.5 TeV
- ✧ UFO stopped after 2nd beam screen warm-up



Friday 12th April 2019



LS2: HL-LHC civil engineering status

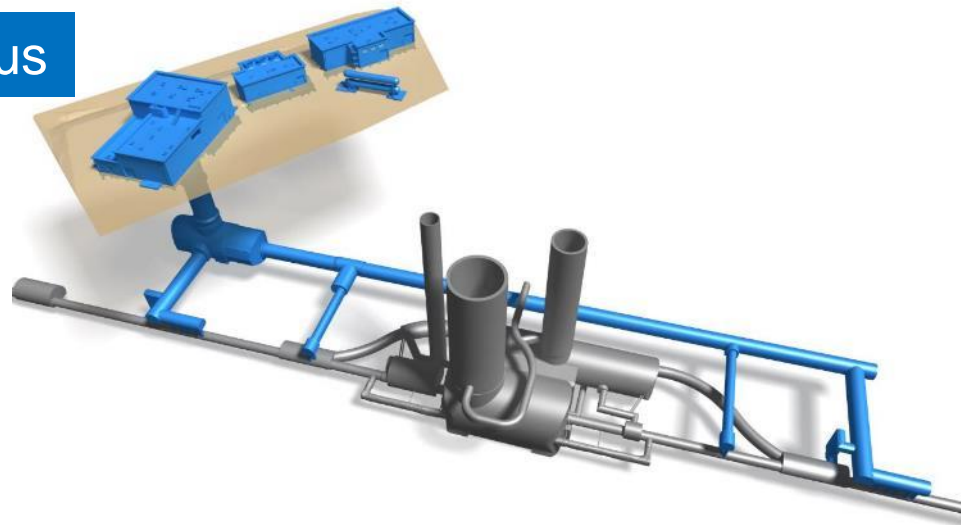
Completion of the shaft excavation at Point 1



Start of cavern excavation at Point 1



LS2: HL-LHC civil engineering status



Completion of the shaft excavation at Point 5



Shaft picture seen from the top



Start of cavern excavation at Point 5

LS2: The Long Shutdown 2 – Dashboards & Broken lines



The progress of the LS2 could be followed with dashboards updated every week:

<https://lhcdashboard.web.cern.ch/lhcdashboard/ls2>



6.5 km still 35.7 km

The LS2 is a marathon and will not be all plain sailing but thanks to a solid preparation and to the dedication of numerous persons, a successful start respecting the motto:

- 1st Safety**
- 2nd Quality**
- 3rd Schedule**

Thanks for your attention